SMART CAMPUS TO ENHANCE COLLEGE MANAGEMENT

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Abstract- A smart campus is a digitally enabled environment that makes use of cutting-edge technologies to improve college administration. A smart campus utilizing face recognition technology for attendance and event hall booking is a comprehensive solution that enhances college management. Traditional attendance systems and event hall booking processes often face challenges in accuracy, efficiency, and security. Face recognition for attendance is a technology that utilizes facial biometrics to automate the process of tracking and recording attendance in various settings, such as educational institutions, workplaces, or events. It provides accurate attendance recording, minimizing errors and preventing proxy attendance. It reduces administrative tasks, eliminates fraudulent practices, and provides a seamless and convenient experience. The event hall booking project aims to streamline the process of reserving event spaces at a college or university. Event booking in colleges refers to the process of reserving and managing event spaces within the campus premises. By implementing a digital platform, users can easily access the system, view availability, and make bookings efficiently. The project integrates features such as real-time updates, automated confirmation, and flexible scheduling options to enhance the user experience. It involves providing a platform or system that allows students, faculty, and staff to request and secure venues for various events such as conferences, seminars, workshops, cultural activities, and student organization events. By utilizing smart solutions, colleges can achieve greater efficiency, cost savings, and improved overall experiences for students and staff.

Key Words: Cascade Classifier, face recognition, attendance, event hall booking, real-time updates, efficiency, biometrics.

1. INTRODUCTION
Smart Campus project aims to provide a technology-driven solution to improve the efficiency and convenience of campus management. With the increasing number of students and staff, it becomes challenging to manage various campus activities, including attendance management, hall booking, and event scheduling.

To address these issues, the project proposes the use of two systems: Face Cam Attendance System and Hall Booking System. The Face Cam Attendance System is a modern-day solution to traditional attendance management, which eliminates the need for manual attendance taking. The system uses computer vision and machine learning algorithms to capture students' attendance using facial recognition technology, making the process much faster and more efficient.

The Hall Booking System is a solution to the manual process of booking halls for various events on campus. The system streamlines the entire process by providing an online platform for students and staff to book halls, check hall availability and pricing, and manage event details.

The project's use of modern technologies such as Python, Flask, OpenCV, and SQL Alchemy ensures the systems' reliability and scalability. The proposed solution provides a one-stop solution to campus management, making it more organized and accessible to all.

In summary, the smart campus project with face cam attendance and hall booking system is a cutting-edge technology solution that offers significant benefits to educational institutions. With this project, we aim to streamline the attendance and booking processes, enhance security, and improve the overall campus experience for students, staff, and visitors. By leveraging the latest technology and innovative ideas, we are confident that this project will be a game-changer in the education sector. We look forward to implementing and delivering a successful project that will transform the way educational institutions operate.

1.1. PURPOSE
The main goal of this project is to create a smart campus system that utilizes face recognition technology for attendance tracking and a hall booking system for easy scheduling and management of events. The ultimate aim is to enhance the efficiency and productivity of the campus while also ensuring the safety and security of the students and staff. By automating attendance tracking and event scheduling, the system will reduce manual labor and save time for both students and staff, allowing them to focus on more important tasks. The system will also provide valuable data insights that can help improve campus operations and decision-making.
2. PROBLEM STATEMENT
The manual attendance taking process is prone to errors, manipulation, and consumes a significant amount of time and resources. The manual system also lacks a real-time monitoring system, which leads to difficulties in tracking attendance records and managing the overall attendance process. Additionally, the manual hall booking process is tedious, error-prone, and lacks an efficient method for managing bookings, which leads to confusion and mismanagement. The existing system’s limitations significantly hinder the ability of the college to manage student attendance and event management effectively. These problems call for a need for an automated, efficient, and reliable system that can manage student attendance and hall booking with ease and effectiveness.

3. PROPOSED SOLUTION
Our Proposed solution is the implementation of a Smart Campus, which includes two sub-projects: the Face Cam Attendance System and the Hall Booking System. These systems aim to reduce the workload of staff and students by providing an automated attendance tracking and hall booking process, respectively. The Face Cam Attendance System utilizes modern technologies such as Python, Flask, OpenCV, and Cascade Classifiers to detect and recognize faces of students, saving their attendance records in a CSV file. With this system in place, attendance tracking becomes more efficient and accurate, eliminating the need for manual record-keeping. Meanwhile, the Hall Booking System streamlines the process of booking a hall for events by providing real-time availability of the halls, as well as a user-friendly interface for booking. The system is built using SQL Alchemy, Python Flask, HTML, and CSS. This system eliminates the need for paper-based booking forms and reduces the workload of staff members who are responsible for managing hall bookings. Overall, the Smart Campus project proposed a solution to the problems faced by the existing system in terms of manual attendance tracking and hall booking processes. By implementing the proposed solution, the college management can take a step towards a more automated, efficient, and hassle-free approach to managing the campus.

Novelty - Smart campus project includes a face cam attendance system and hall booking system, utilizing modern technology to improve campus management processes. The face cam attendance system automates attendance-taking with computer vision, while the hall booking system maximizes space utilization. This unique and innovative approach to campus management is a novel idea.

Social Impact - The smart campus project benefits both students and staff, with the face cam attendance system improving student success and engagement, and the hall booking system increasing access to campus spaces. The project has the potential to positively impact campus life and culture.

Business Model - The project could generate revenue through selling or licensing the technology to other campuses, integrating it into existing management software, or offering premium features for a fee. The business model would depend on factors such as market demand, competition, and budget.

Scalability - The smart campus project can be adapted to fit the needs of different campuses and institutions, with the technology being updated and improved over time. With proper planning, it has the potential to scale to a wide range of campuses and institutions domestically and internationally.

4. DATA FLOW DIAGRAM(DFD)

The face recognition attendance project employs advanced facial recognition technology to automate the attendance-taking process. When a new user is registered, the system captures their facial features and stores the data in a separate folder. This process is
repeated for all users, allowing for accurate and efficient attendance tracking. However, if the system fails to recognize a user's face, attendance cannot be recorded.

5. SOLUTION ARCHITECTURE

![Solution Architecture Diagram]

Figure 5.1 Solution Architecture

6. TECHNICAL ARCHITECTURE

![Technical Architecture Diagram]

Figure 6.1 Technical Architecture

7. FEATURES

7.1 FEATURE 1: FACE Cam Attendance System

Face recognition module is a powerful technology that uses computer vision techniques to identify individuals and verify their identities. The process begins with the system capturing an image of the person's face and analysing the unique features of the face, such as the distance between the eyes, the shape of the nose, and the contours of the face. These features are then compared to the images stored in the database to determine if there is a match.

Face recognition module has a wide range of applications, including attendance management, access control, and security monitoring. In attendance management, the technology can be used to accurately track the attendance of employees and reduce the possibility of time fraud. In access control, it can be used to control access to sensitive areas and ensure that only authorized individuals are granted entry. In security monitoring, it can help security personnel quickly identify potential threats and take appropriate action.

![Face Cam Detection](image)

Figure 7.1.1 Face Cam Detection

7.2 Feature 2: Hall Booking System

Hall Booking System is a simple, efficient system for booking halls for events. Users can view the available halls and the system shows how many halls are currently booked. When someone wants to book a hall, they can select the desired hall and book it. The request is sent to the administrator for approval, and the hall is booked upon approval. This system helps to streamline the hall booking process and reduce the need for manual work. Posters are meant to be both visually appealing and informational. We have added posts on new bank updates so that customers are aware of new bank services.
8. ALGORITHM USED
8.1 CASCADE CLASSIFIER
A cascade classifier is a machine learning algorithm used for object detection. It is a type of classifier which is capable of detecting objects in images or video frames by analysing different features of the object. Here, for this problem, the cascade classifier is used as a face-detection model.

The goal of the Cascade Classifier is to use a set of positive and negative images to train a classifier that can recognize a particular face or object. The cascade classifier is so named because it uses a cascade of simple classifiers to quickly eliminate non-face regions of the image. The first classifier is a simple feature-based classifier that eliminates the majority of non-face regions. The remaining classifiers become increasingly complex, refining the selection of face regions.

9. PERFORMANCE METRICS
Performance metrics can be measured using the confusion matrix. The confusion matrix for face detection can contain four values: true positives, false positives, true negatives, and false negatives.

True positives are the number of faces correctly detected by the classifier, false positives are the number of non-faces incorrectly identified as faces, true negatives are the number of non-faces correctly identified as non-faces, and false negatives are the number of faces that were not detected by the classifier.

Other performance metrics for cascade classifier include precision, recall, and F1-score. Precision measures the proportion of true positives to the total number of positive predictions, while recall measures the proportion of true positives to the total number of actual positives. F1-score is the harmonic mean of precision and recall.

Overall, the performance metrics for the cascade classifier can provide insight into its accuracy and efficiency in detecting faces in images or videos.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metrics</td>
<td>Classification Model: CA</td>
</tr>
<tr>
<td></td>
<td>Accuracy Score: 87 %</td>
</tr>
<tr>
<td></td>
<td>Precision: 84%</td>
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</tbody>
</table>

Table 9.1 Performance Metrics

10. CONCLUSION
In conclusion, the Smart Campus project is a forward-thinking initiative that aims to improve the traditional education system by leveraging cutting-edge technology. The Face Cam Attendance System and Hall Booking System are two major sub-projects that are designed to streamline college and school management, making it more efficient, accessible, and user-friendly. The Face Cam Attendance System automates the process of taking attendance, reducing manual labour and improving accuracy, while the Hall Booking System simplifies the process of reserving halls and other facilities for various events, conferences, and activities. The Smart Campus project is an excellent example of how technology can be used to revolutionize education, and it has the potential to benefit students, teachers, and administrators alike.
11. FUTURE ENHANCEMENT
As with any technology project, there are always opportunities for future enhancements and advancements. The Smart Campus project has significant potential for further development and enhancement. A few ideas for future improvements include implementing a bus tracking system to help students and staff stay informed about the location of campus buses, engaging the principal and vice principal in the project to increase leadership support and guidance, setting up a lost and found system to help students recover lost items, and introducing an on-campus payment system for various services. By continuing to explore new technologies and ideas, the Smart Campus project has the potential to continue revolutionizing education management and streamline processes for everyone involved.

12. SAMPLE OUTPUT

![Figure 12.1 Face Attendance Preview](Image1)
![Figure 12.2 New User For Attendance](Image2)
![Figure 12.3 Detecting Face of New User](Image3)
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